

# Degrading riverine habitats

## Conservation is imperative

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BANGLADESH is a land of rivers. In the 11th century, there were 1 400 1 500 rivers, which reduced to about 700 in recent years due to various natural and anthropogenic factors. However, now only 100 rivers flow round the year with navigable depth. Total length of the rivers is 24,140 km, which covers 8 percent area of the country. The catchment area of river systems is about 1.61 million km<sup>2</sup>. There are 57 trans-boundary rivers, 54 with India and three with Myanmar. All the transboundary rivers have been dammed to divert flow for agricultural production and hydropower generation. Three principal river systems, the Barak-Meghna, Brahmaputra-Jamuna and Ganges-Padma, and 300 other major rivers carry main water load from the Himalayas. Total water flow of these rivers is about 1,074 billion m<sup>3</sup> and another 251 billion m<sup>3</sup> accumulate within the country through rainfall. It is estimated that storage of about 150 billion m<sup>3</sup> of water is necessary to maintain navigability of the rivers.

Rivers have been the major sources of fish production in Bangladesh from time immemorial. It has been reported that inland fisheries composed of 260 fish species belonging to 145 genera, representing 55 families. Fish species diversity and production from rivers have declined within four decades due to natural and anthropogenic disturbances.

### Nature of riverine habitat degradation

#### Physical degradation

**Decreased water flow:** Results showed that water flow of 97 percent of total study rivers decrease to a critical level especially in the dry season (November to May). It is due to flow diversion and water with drawl by the Indian authority from the 54 transboundary rivers (Table 1). Recently Indian government has lunched "River interlinking project" costing US\$ 124 billion to divert natural water flow from 38 transboundary rivers of the Northeast States to the North and Southwest States of India (Panjab, Rajstan, Horiyana, Guzrat, Maddya pradesh, Bihar). India has planned to divert about 173 billion m<sup>3</sup> of water from the aforesaid rivers.
   
If the plan is implemented as it is, then the Indian authorities will build 74 large and 34 medium water reservoirs at mountains and hundreds of pumps will be used to store water over there. Water will transferred from reservoirs through surface elevation. Very recently, Indian authority has started to construct a hydroelectric multi-purpose high dam on the river Barak, the origin of the river

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sand bars were found in 87 percent of rivers.
   
**Siltation of river mouth:** Mouth of 77 (12%) rivers has silted up due to continuous siltation. Mouth-silted

introduced and cultured in ponds of Bangladesh. All the aliens are carnivorous in feeding habits. During high flood, these species can be spread into the rivers of Bangladesh.

All over the world, rivers are used as damping grounds of industrial and municipal wastes and effluents. Pollution from industrial, municipal and domestic discharges is an acute problem of the many rivers of Bangladesh and in the dry/winter season, no fish are found in these rivers. Moreover, residues of many agro-chemicals are washed down through surface run-off to the river systems, which is responsible for riverine habitat degradation, and disappearance of many fish species and decreased fish production. Unauthorised encroachment is a serious problem all over the country.

#### Conclusion

Most rivers of Bangladesh are going to be dead gradually because of erosion and siltation in the rainy season and low flow in the dry season. This study suggests that these rivers should be dredged to protect and conserve fish habitats and, riverine fish and their fisheries. However, in reality, dredging of river systems is a costly operation, which needs International aid, assistance, technical support and cooperation. Considering the cost of dredging, it is recommended to dredge a stretch of about 5 to 10 km of each river, which will act as a fish sanctuary of that particular river. Moreover, the dredged stretch of the river may be used as a source of domestic water supply for the nearest city / town. Silted mouth of rivers should be dredged to facilitate migration of diadromous fish species.

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UN Water Convention 1997, United Nations Environment Programme 1993, World Bank Water Resources Management 1993, Biodiversity Convention 1992, UNESCO World Heritage Convention 1972, Helsinki Rules 1966 to get natural flow from shared or common rivers originated in India and Myanmar. It is also recommended to take measures to protect and conserve riverine ecosystems from being polluted and encroachment upon.

In this connection, Environment and Industrial Acts, the Territorial Waters and Maritime Zones Acts 1974 should be implemented strictly.

Protocols/guidelines should be developed for introduction of exotic fish species. To control over and illegal fishing, Fisheries Act should be applied strictly. It is also recommended to undertake detail studies on geo-morphological and ecological status of the rivers of Bangladesh in order to formulate guidelines for the management, protection and conservation of riverine habitats of Bangladesh.

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Table 1: Transboundary rivers with origin, interventions and entrance point in Bangladesh

Sl.	River	Origin	Entry point in Bangladesh	Interventions
1	Atrai	Malda, India	Dabeegani, Panchagar	Dam
2	Bangalee	Meghalaya, India	Panchagar	Dam
3	Barak	Monipur, India	Amalsid, Sylhet	Dam & Reservoir
4	Berong	Meghalaya, India	Tatulia, Panchagar	Dam
5	Bhersa	Meghalaya, India	Tatulia, Panchagar	Dam
6	Bhulee	Meghalaya, India	Ghoramara, Panchagar	Dam
7	Boraghat	Meghalaya, India	Haluaghat, Mymensingh	Dam & Reservoir
8	Brahmaputra	China, India	Mymensingh	Dam & Reservoir
9	Chalakkhalee	Meghalaya, India	Sherpur	Dam
10	Chayoi	Meghalaya, India	Sadar, Panchagar	Dam
11	Dawkh	Meghalaya, India	Tatulia, Panchagar	Dam
12	Dharala	India	Shimulbaree, Kurigram	Dam
13	Dudkumar	Meghalaya, India	Kurigram	Dam
14	Feni	Tripura, India	Feni	Dam/Pump
15	Fulkumar	Meghalaya, India	Kurigram	Dam
16	Gabura	Meghalaya, India	Tatulia, Panchagar	Dam
17	Gumria	Meghalaya, India	Haluaghat, Mymensingh	Dam & Reservoir
18	Gumtee	India	Comila	Dam & Reservoir
19	Halhalia	Meghalaya, India	Kurigram	Dam
20	Isamotee	West Bengal, India	Satkhira	Dam
21	Jafong	India	Jafong, Sylhet	Dam
22	Kalaghusha	Meghalaya, India	Sherpur	Dam
23	Kalindee	West Bengal, India	Satkhira	Dam
24	Karatoa	Meghalaya, India	Sadar, Panchagar	Dam
25	Karnajura	Meghalaya, India	Sherpur	Dam
26	Khowai	Paddabeel, Khowai, Meghalaya, India	Balla, Habiganj	Dam & Reservoir
27	Kuleek	West Bengal, India	Ranishangkail, Thakurgoan	Dam
28	Kurum	Meghalaya, India	Sadar, Panchagar	Dam
29	Mahananda	Fulbari, Jalpaiguree, India	Banglabandha, Tatulia, Panchagar	Dam
30	Maharashree	Meghalaya, India	Sherpur	Dam
31	Mailehee	Meghalaya, India	Sherpur	Dam
32	Mathabhanga	Jalongee, Morshidabad, West Bengal, India	Doaltapur, Kushtia	Dam/Pump/Reservoir
33	Muhuree	India	Beelonia, Feni	Dam & Reservoir
34	Naff	Arkan, Myanmar	Taknaf, Cox's Bazar	Dam
35	Nagor	Meghalaya, India	Atwaree, Panchagar	Dam
36	Padma / Ganges	Farakka, India	Rajshahi	Barrage & Reservoir
37	Pam	Meghalaya, India	Sadar, Panchagar	Dam & Reservoir
38	Panga	Meghalaya, India	Sadar, Panchagar	Dam
39	Pathraj	Meghalaya, India	Boda, Panchagar	Dam
40	Punarvaba	West Bengal, India	Dinaipur	Dam
41	Ranachandee	Meghalaya, India	Tatulia, Panchagar	Dam
42	Sangu	Arkan, Myanmar	Bandarban	Dam
43	Seelonia	Melaghar, India	Parshuram, Feni	Dam
44	Shankha	Arkan, Myanmar	Bandarban	Dam
45	Shao	Meghalaya, India	Tatulia, Panchagar	Dam
46	Shunavaree	Meghalaya, India	Kurigram	Dam & Reservoir
47	Shumeshwaree	India	Beresheree, Durgapur	Dam
48	Shenggia	Meghalaya, India	Atwaree, Panchagar	Dam
49	Sonai	Tripura, India	Kosba, Brahmanbaria	Dam
50	Talma	Meghalaya, India	Sadar, Panchagar	Dam & Reservoir
51	Tanggon	West Bengal, India	Atwaree, Panchagar	Dam & Reservoir
52	Teernai	Meghalaya, India	Tatulia, Panchagar	Dam
53	Teesta	Gazaldoba, India	Rangpur	Dam & Reservoir
54	Teetas	Tripura, India	Akhaura, Brahmanbaria	Dam & Reservoir
55	Vogai	India	Naleelabaree, Sherpur	Dam & Reservoir
56	Zinzeeram	Meghalaya, India	Kurigram	Dam
57	Zoorapanee	Meghalaya, India	Tatulia, Panchagar	Dam

main rivers include the Meghna, Feni, Muhuree, Karnaphulee, Bakkhalee, Tatulia, Ilisha, Andharmanik, Payra, Lohalia, Raymongal, Arpanga, Sheebsha, Pasur and all the rivers and tributaries of the Sundarbans.

**River erosion:** About 41 percent of rivers suffer from erosion problems and siltation rate has increased in 574 (86%) rivers. During rainy season, erosion is serious in the rivers Arial Khan, Baleshwar, Dhaleshwaree, Dharala, Jamuna, Meghna, Padma and their tributaries.

**Obstruction in fish migration routes:** Constructing flood control structures have obstructed fish migration routes in many rivers. It is reported that about 35 million ha of marshy land have disconnected from rivers due to implementation of 500 Flood Control Drainage and Irrigation projects during the last 60 years. Important flood control structures are on the rivers Baral, Dhanaguda, Feni, Gorai, Halda, Jamuna, Kapotakkyia, Manoo, Meghna, Munuree and Teesta.

**Unauthorised encroachment:** Result revealed that width of 158 (24%) rivers has decreased due to unauthorised encroachment. Affected major rivers are the Buriganga of Dhaka, Baloo, Turag and Bongshee of Tongi, Kaleeganga of Manikganj, Kapotakkyia and Nabaganga of Jessore, Tulshiganga and Pagla of Naogaon, Arial Khan of Faridpur, Narashunda and Kalagasia of Kishoreganj, Surma of Sylhet and Karnaphulee of Chittagong.

#### Chemical pollution

**Industrial wastes and effluents:** Results showed that 11 percent of total rivers are polluted due to industrial effluents, agro-chemicals and domestic garbage (Table 2). During winter season, water of the rivers Buriganga and Shitalakkyia become poisonous not only to humans but also to birds and animals.

**Agro-chemicals:** About 1.6 million tons of inorganic fertilizers are used every year in Bangladesh. Moreover, a total of 4000 5000 tons of 242 types of pesticides are used annually for crop production. The flood and rainwater carry residues of these huge agro-chemicals to the river, haor and beel systems for final discharge in the coastal regions. Consequently, riverine habitats became degraded and many fish species have disappeared.

#### Biological degradation

A total of 15 exotic fish species have been introduced in Bangladesh for aquaculture and 93 fish species for ornamental purposes. Recently, *Thaui rupchanda* / *Piranha* (*Serrasalmus nattereri* ?), *Thai koi* (*Anabas* sp.), *Thai chitol* (*Notopterus* sp.) have also been

Consequently, they may cause biological disaster in the riverine ecosystems of the country. Lake Kaptai is already polluted by the *Tilapia* (*Oreochromis* spp) as the species has self-sustaining populations. Self-sustaining populations of *Carpio* (*Cyprinus carpio*) and *Silver carp* (*Hypophthalmichthys molitrix*) are found in the rivers and haors of Sylhet-Mymensingh basin and in the Chalan beel. Being prolific breeders, *Tilapia* and *carpio* are polluting breeding and nursery grounds of many indigenous fish species. Similarly, *Silver carp* is more efficient feeder than the native *Catla* (*Catla catla*) and it is assumed that *Catla* populations will be declined in the presence of the alien *Silver carp*.

#### Discussion

Decrease in water flow is the main cause of physical degradation of riverine habitats of Bangladesh. Water flow in most rivers decreases alarmingly especially in winter season due to water withdrawal and flow diversion from the principal rivers by the Indian authority. Many rivers of Bangladesh flow only in the rainy season (May to October) with surface run-off and discharge from the hills. In winter season many rivers dry up due to low flow.

Number of dead rivers is increasing day by day due to siltation. Increased siltation, submerged sand bars and decreased depth in many rivers are due to high silt load carried by the principal river systems, the Barak-Meghna, Brahmaputra-Jamuna and Ganges-Padma. The principal river systems transport annual sediment loads of between 1.7 and 2.4 billion tons and silt deposition rate is about 35 million t yr<sup>-1</sup>. If this rate of siltation is continued and rivers are not dredged, then all the tributaries of these rivers will be silted up within next 25 years. Currently, navigation route reduced from 24,100 km to only 3,700 km during dry season. Disrupted navigation system impacts negatively on economy of the country as half of total transported commodities in the country are transported through riverways and more than 40 percent of total passengers depend on the river transport systems.

Erosion is a major problem in many rivers of Bangladesh. During dry season, sluice gates on the transboundary rivers in India are kept close to divert water flow, while in monsoon all the gates are kept open to pass huge water. This sudden high flow creates serious erosion and flooding. In 1974, 1988, 1998 and 2004 Bangladesh experienced severe floods.

Table 2: Major polluted rivers in Bangladesh

River	Polluting industry	Discharge rate	Pollutants/Chemicals	Remarks
Karnaphulee	144 industries	10 – 12 million gallon day <sup>-1</sup>	Hg, Pb, Cr, Cd & As	Poisonous water, Fish diversity and density have declined alarmingly.
	297 industries	400 t waste day <sup>-1</sup>	Degradable and persistent organic and inorganic compounds	
	40 – 50 Oil tankers	6 000 t yr <sup>-1</sup>	Oil, lubricants	
Sangu	Fishermen	Huge	Fish poison (Toxic chemicals)	Fish killing
Bhairab	Khulna News Print Mills	4 500 m <sup>3</sup> hr <sup>-1</sup>	K, Ca, Mn, Fe, Cu, Zn, As, Br, Pb, Ni, Sr, Cd, Rb and Ti	No fish
Mongla, Pasur and Rupsha	Merchant ships, oil tankers and marine vessels	Huge	Oil, grease and other lubricants	Decreased fish species diversity and production
Rupsha	Khulna city	10 t day <sup>-1</sup>	Solid and liquid wastes	Decreased fish production
Nabaganga	Mobarakganj Sugar Mills	Huge	Chemical mixed effluents	No fish
Mathavanga	Carew & Company, Darshana Sugar Mills	Huge	Chemical mixed effluents	No fish
Kapotakkyia	Jessore city	Huge	Solid and liquid wastes	No fish
Shitalakkyia	Meghna Cement Factory, Ghorasal Urea Fertiliser Factory	Huge	NH <sub>3</sub> , CaCl <sub>2</sub> , NaOH, H <sub>2</sub> SO <sub>4</sub> and lubricants	No fish
Buriganga	Five main drains of Dhaka city	0.60–2.9 m <sup>3</sup> s <sup>-1</sup>	Untreated domestic and industrial effluents	No fish
	277 tanneries	88 t waste and 22 000 litre of effluent yr <sup>-1</sup>	Different chemicals	
	Passenger and merchant ships	Huge	Oil, grease and lubricants	
Turag	250 different industries	Huge	K, Ca, Mn, Fe, Cu, Zn, As, Br, Pb, Ni, Sr, Cd, Rb and Ti	No fish
Baloo	268 different industries	Huge	Cd, Cr, Pb, As and Zn	No fish
Bongshee	Different industries	Huge	Chemical mixed effluents	No fish
Kaleeganga	Fabric industries	Huge	Chemical mixed effluents	No fish
Meghna	Ashuganj Fertiliser Factory	Huge	Ammonia and other chemicals	Decreased fish production
Brahmaputra	Mymensingh city, industries and factories	Huge	Chemical mixed effluents	Decreased fish production
Jamuna	Jheel Bangla & Dewanganj Sugar Mills, Urea Fertiliser Factory	Huge	NH <sub>3</sub> , CaCl <sub>2</sub> , NaOH, H <sub>2</sub> SO <sub>4</sub> and lubricants	Decreased fish production
Hareedhoya, Kalagasia and Paharia	2 000 textile mills & fabric industries	Huge	Chemical mixed effluents	No fish
Dhaleshwaree	Cement Factory, other industries	Huge	Chemical mixed effluents	Decreased fish production
Chandana	Faridpur Sugar Mills	Huge	Chemical mixed effluents	Decreased fish production
Surma and Dhanu	Chatak Paper and Pulp Mill	1 200 – 1 300 m <sup>3</sup> ha <sup>-1</sup>	NaOH, Cl, Hg, calcium hypochloride	Decreased fish production
Kushiyara	Fenchuganj fertilizer factory	Huge	CO <sub>2</sub> , NH <sub>3</sub> , SO <sub>2</sub> (CO <sub>2</sub> + N <sub>2</sub> ), oil, CaCl <sub>2</sub> , NaOH, H <sub>2</sub> SO <sub>4</sub> and lubricants.	Decreased fish production
Tulshiganga	Industries Naogaon Municipal area	Huge	Solid and liquid wastes and effluents	No fish
Narod Nad	North Bengal Sugar Mills and Jamuna Distilleries	Huge	Chemical mixed effluents, hot water (over 100 °C)	No fish
Padma	North Bengal Paper Mills	Huge	NaOH, Cl, Hg, calcium hypochloride	Decreased fish production
Karatoa	Panchagar & Salabaganj Sugar Mills, Zaz Distilleries	Huge	NH <sub>3</sub> , CaCl <sub>2</sub> , NaOH, H <sub>2</sub> SO <sub>4</sub> , lubricants, hot water (over 100 °C)	No fish
Jamuneshwaree	Shampur Sugar Mills, Rangpur Distilleries	Huge	NH <sub>3</sub> , CaCl <sub>2</sub> , NaOH, H <sub>2</sub> SO <sub>4</sub> , lubricants, hot water (over 100 °C)	No fish
Kirtonkhola	Municipal & Industries	Huge	Chemical mixed effluents & wastes	Decreased fish production